GasClam Instrument User Manual V1.5

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Declaration of Conformity

The manufacturer, Elok-Opava, hereby declares and confirms that the characteristics of the product conform to the technical requirements stipulated by the technical standards. Furthermore, the manufacturer declares the product to be safe whilst adhering to the correct conditions for its installation, maintenance and use.

Manufacturer: Elok-Opava s r.o., Sàdek 17, 747 75 Velké Heraltice, Czech Republic

Product Description: A landfill Gas monitor designed for in-situ borehole monitoring. The entire casing is made from solid stainless steel. The battery pack is in the upper part of the housing in a flame-proof casing. The measuring unit consisting of four gas sensors is located in the intrinsically safe lower part of the housing. The valves, pump and filter assembly are located at the bottom of the housing.

Authorised Subject: FTZÚ, AO 210, NB 1026, Pikartská 7, 716 07 OSTRAVA-RADVANICE, IČO-00577880

Type of Protection: Ⓔx II 2G Ex d ib [ib] IIB T4

Certificate Number: Quality assurance notification: FTZÚ 02 ATEX Q 025 according to EN 13980, CE 1026
FTZÚ 07 ATEX 0105X

Method of Determining Conformity: The product's conformity with the respective requirements of directive 94/9/EC
- it was compared with the submitted documentation
- it was tested according standards

List of Technical Regulations and Standards:

02600-00-001, NKO	
PTTI EN 60079-0:2006	Electrical Apparatus for Potentially Explosive Atmospheres – General Requirement
PTTI EN 60079-1:2004	Electrical Apparatus for Explosive Gas Atmospheres. Flameproof enclosures 'd'
PTTI EN 60079-11:2007	Explosive Atmospheres – Equipment Protection by Intrinsic Safety 'I'
Directive 2004/108EC	EN 61326-1:2006 – Electrical Equipment for Measurement

Name: Ing. Jiri Klein **Position**: Managing Director

Signature: **Date:** 03/06/2008

Introduction to GasClam

GasClam is the world's first in-situ borehole gas monitor, suitable for the detection of a wide range of gasses commonly found in borehole monitoring, including Methane (CH_4), Carbon Dioxide (CO_2) and Oxygen (O_2). In addition to this the GasClam monitors temperature, barometric pressure and borehole pressure.

All of these readings can be taken at programmable intervals, providing an invaluable set of data to the user. The default setting for the Gasclam is to take readings every hour, giving it approximately one months' operational life. Data is downloaded either using a computer or via an optional modem and can be viewed within the GasClam software or exported for analysis in Excel. Whilst connected to the software the settings of the GasClam unit can be altered, including the frequency at which samples are taken and selecting venting options.

In addition to the sensors already mentioned, the GasClam can be upgraded with a Photo ionisation Detector (PID) for detection of Volatile Organic Compounds (VOC's), a Carbon Monoxide (CO) sensor, Hydrogen Sulphide (H_2S) sensor and a water depth sensor should the data be required.

Ion Science Ltd recommends that regular customer bump tests take place in conjunction with an annual service and calibration, which is performed by the Ion Science service department or an Ion Science approved service centre. Before using the GasClam you must read this manual paying particular attention to the section on the effects of water on your GasClam.

Note: Before removing the GasClam from the field it must be run once in atmosphere to purge any hazardous gasses.

The effects of water on your GasClam

GasClam is designed to overcome – as far as possible – the requirement to:

- measure gas concentrations,
- measure borehole and atmospheric pressure,
- allow a venting pathway between the borehole and atmosphere.

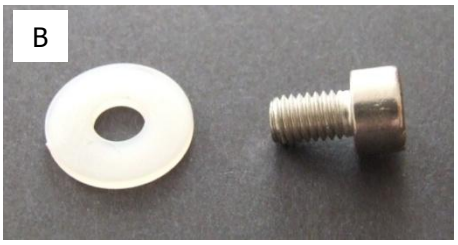
To measure gas concentrations the gas must be dry and measurements of atmospheric pressure should not include the pressure of overlying water. As the GasClam can be in a position liable to flooding from above (flooded headworks) and below (high borehole water level) your help is required to optimise the performance of your GasClam by:

- carrying out simple preventive and remedial maintenance
- being aware of the limitations of data gathered under flood conditions.

1. Keeping your GasClam dry and clean in regular use

To dry the gas before measurement there is a moisture stripping filter in the bottom section of the GasClam. Over time this will hydrate and its ability to remove moisture will decrease. If moisture is not successfully removed, concentration readings will be affected. If the moisture stripping filter is completely saturated it can dissolve, and it will then be pumped in to other sections of the GasClam resulting in catastrophic failure. This will always be avoided if the GasClam is installed vertically and the filter is replaced after every 800 samples. However, it is recommended to renew the filter whenever a visit is made to the GasClam to ensure optimal performance during data collection (see service and calibration section).

To prevent water reaching the vent pathway the snorkel should always be attached to the vent hose barb. The top of this should be supported so it is located at the top of the headworks to reduce the chance of water ingress. In situations where the headworks is likely to be flooded the hose barb must be replaced by the vent blank. The supplied box spanner can be used to remove the hose barb and the supplied vent Alan key used to replace with the vent blank and washer.



The GasClam should always have the snorkel attached to the vent hose barb (a). In situations where the headworks is likely to flood the hose barb must be replaced by the vent blank and washer (b).

The effects of water on your GasClam

2. Effects of flooding on data and GasClam

When the unit is not sampling it has an ingress protection rating of IP-68 (submersible to 10 meters for 1 week).

However,
- Immersion will effect data and
- May require subsequent corrective action

These effects and requirements will differ whether immersed from above, i.e. flooded headworks, or from below, i.e. rise in borehole water level, see table below:

Flooded Headworks		Remedial action	Preventive maintenance
Effects on data	should vent breather be submerged: • atmospheric pressure reading will be incorrect and will remain incorrect • Scheduled venting will be ineffective.	Use borehole pressure as approximate replacement or use data from another source.	If chamber is known to flood, or is already full of water • Chose another chamber • Or **replace snorkel with bolt**
Effects on GasClam	If submerged for an extended period the vent pipe may become flooded. The vent breather may become clogged by dirty water.	When GasClam is visited • **Check data and call service centre if atmospheric pressure looks strange and they will advise**	If chamber is liable to flooding • replace vent breather each visit

Flooded Borehole		Remedial action	Preventive maintenance
Effects on data	Should water reach the bottom of the GasClam the inflow and outflow valves will remain closed and no samples will be taken: • borehole pressure reading will be incorrect • gas concentration readings will be incorrect	*Data points collected whilst the sampling cycle was disabled will be marked*	If borehole water level is known to be high or is already full of water • Chose another chamber • Or extend the borehole above ground level
Effects on GasClam	None	None	

Getting Started

Packing list

Please take a little time to examine the contents of the GasClam package.

Item	Description	Qty
	Barbs (Fitted)	3
	Box spanner for removing barbs	1
	Blank (NOT Fitted) + washer	1
	Length of pipe (30cm)	3
	Battery Allen Key	1
	Vent blank Allen Key	1
	Communication cable	1
	Start cable	1
	Manual and software (on CD)	1
	Rubber Collar	1
	GasClam Unit	1
	1.5v Duracell Batteries (Fitted)	2
	Moisture Stripping Filter	1
	Accessory Kit	1
	Moisture stripping filter	6
	Snorkel (complete)	1
	Snorkel filter	2
	O-ring (part 22)	5
	O-ring (part 21)	5

Turning on the GasClam

The GasClam can be switched on and off using the remote. The remote connects to the communication port on top of the GasClam.

To start the GasClam hold the button down for two seconds, the red LED will flash rapidly indicating the GasClam has started and is currently going through the processes in a sampling cycle, this equates to 'sampling' mode.

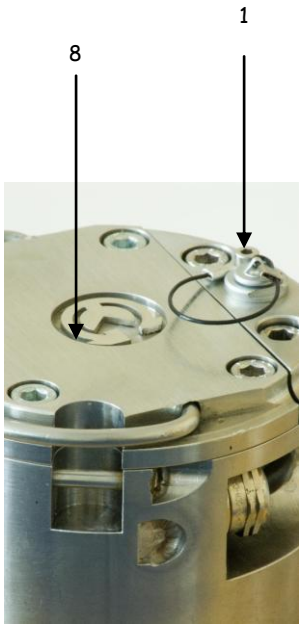
After the sampling processes have finished the red LED flashes intermittently, this equates to the 'measuring' mode.

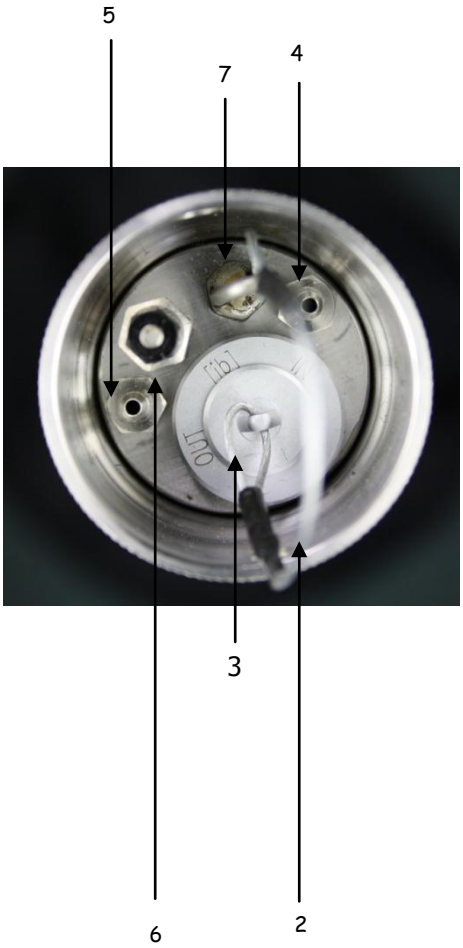
To stop the GasClam press the button for two seconds, when it has stopped the LED will stop flashing, this equates to 'sleeping' mode

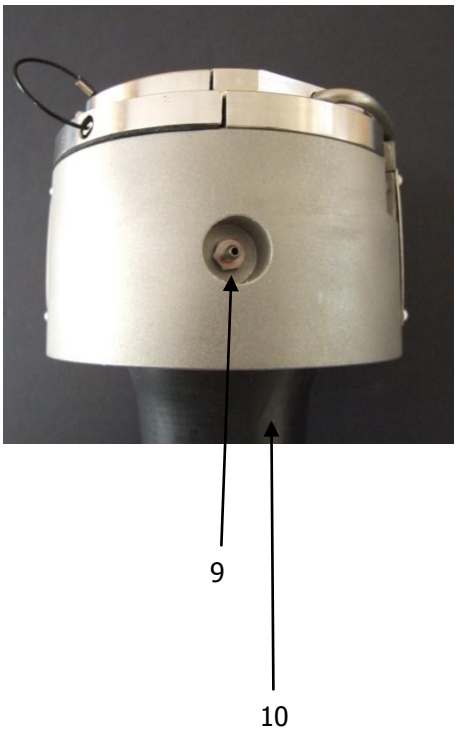
No flashing	Sleeping
Rapid flash	Sampling
Intermittent flash	Measuring

Getting Started

Physical Characteristics





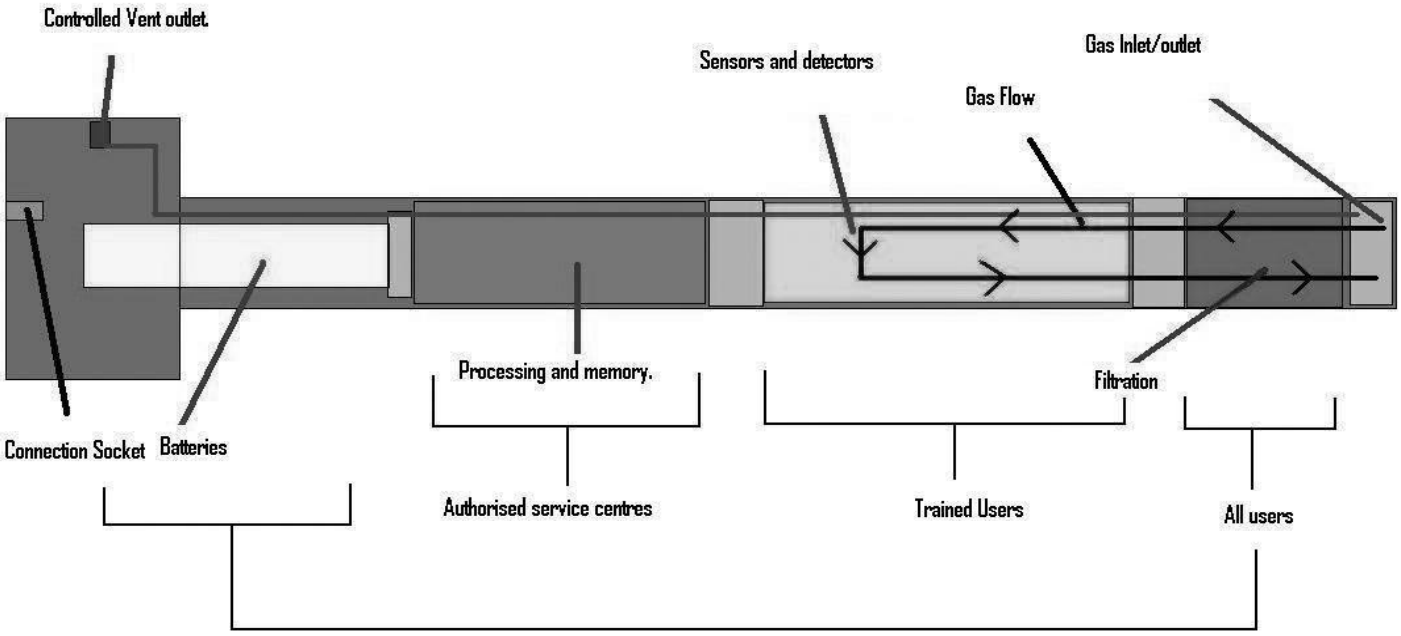


1. Communication port
2. Pressure transducer port
3. Pressure transducer port cap
4. Gas inlet
5. Gas Outlet
6. Water proximity sensor
7. Pressure transducer hook
8. Battery compartment lid
9. Vent (with hose barb)
10. Rubber Collar

GasClam identification plates with intrinsic safety specifications.

Getting Started

How the GasClam Works and access areas



Getting Started

Software Installation

System Requirements

The GasClam software needs 30MB free space on the hard disk for installation.

The programme will run on the following platforms:

- Windows 98
- Windows 98 Second Edition
- Windows 2000 service pack 3
- Windows ME
- Windows Server 2003
- Windows XP service pack 2
- Windows Vista
- Windows 7

The programme needs .Net Framework 2.0 (x86) installed to run properly. This version is included on the software CD, alternatively it can be downloaded from the Microsoft website.

Running the installation software

Insert the installation CD or USB stick and copy the software folder on to the PC.

There are two installation options.

1) If you have an old version of DotNetFX, 2.0 (x86) then double click the 'setup' icon to update the DotNetFX. (If you already have this version and you try to upgrade an error will occur, ignore this and go to the next option)

2) If you already have this version of DotNetFX then double left click the 'GasClamUnit' icon.

The guide will then take you through the installation process step by step.

The default location for the GasClam software is:

C:\Program Files\Salamander\GasClam

Getting Started

Battery Change

Warning:

For reasons of intrinsic safety, batteries MUST NOT be changed within potentially flammable areas. Always ensure you are in a safe area before carrying out any type of maintenance on your GasClam

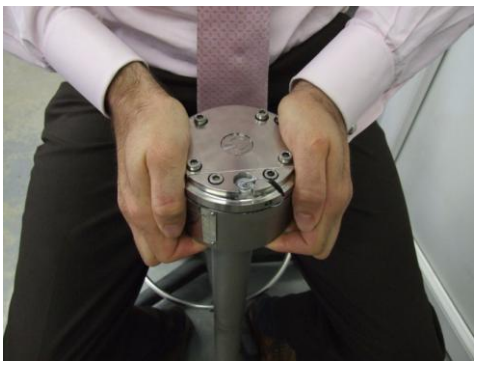
Battery types that can be used:

For Intrinsic Safety and reduced risk of explosion you must only use Duracell 1.5 V LR20 Alkaline-Manganese MN1300 batteries or a 2 x 1,2V LR20 Nickel-metal hydride Saft VH D 9500 rechargeable pack. **Do not mix old and new batteries within the same unit, change both batteries at the same time. Failure to do so will reduce battery life of the new cell fitted.**

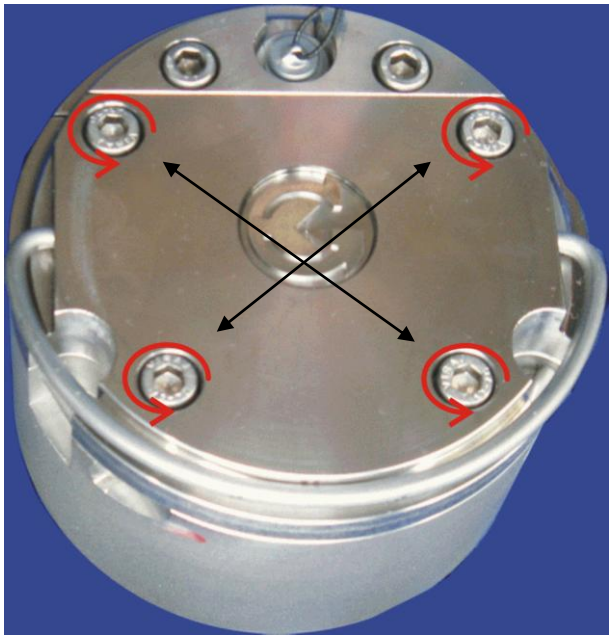
The battery compartment is accessed by removing the 4 screws from the battery compartment lid, see diagram. To remove the batteries tilt the GasClam until they fall out. Replace with the stipulated batteries positive terminal facing down. Take care when replacing the cover to ensure the O-ring is not damaged by following the instructions below:

The integrity of this O-ring should be checked every time the batteries are replaced. This needs to be replaced if any damage is noticed.

Push the battery compartment lid down square on the GasClam



When the O-ring is resting on the battery compartment push the lid down evenly on both sides to ensure it travels down square. This will prevent damage to the O-ring. When the O-ring is sitting in the compartment loosely tighten the screws.



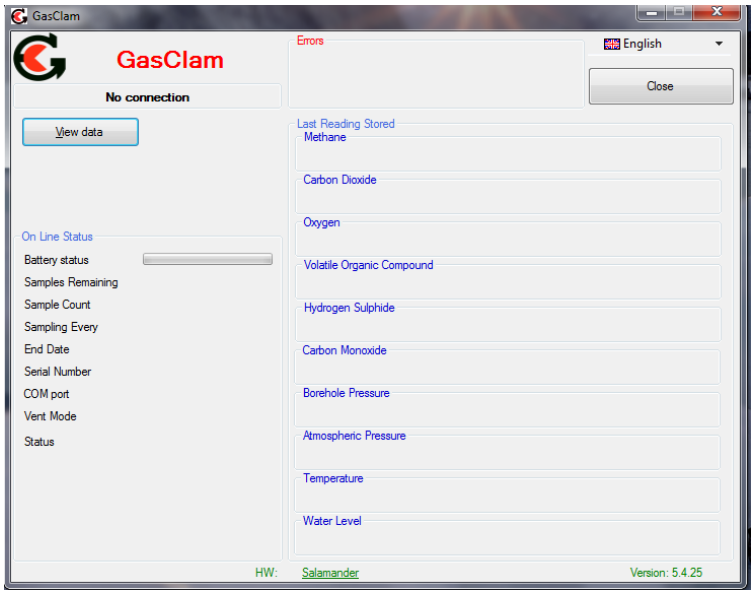
When tightening the cover alternate between screws to ensure the cover sits on the GasClam squarely. If this is not done the O-ring may be damaged.

Software

Connecting

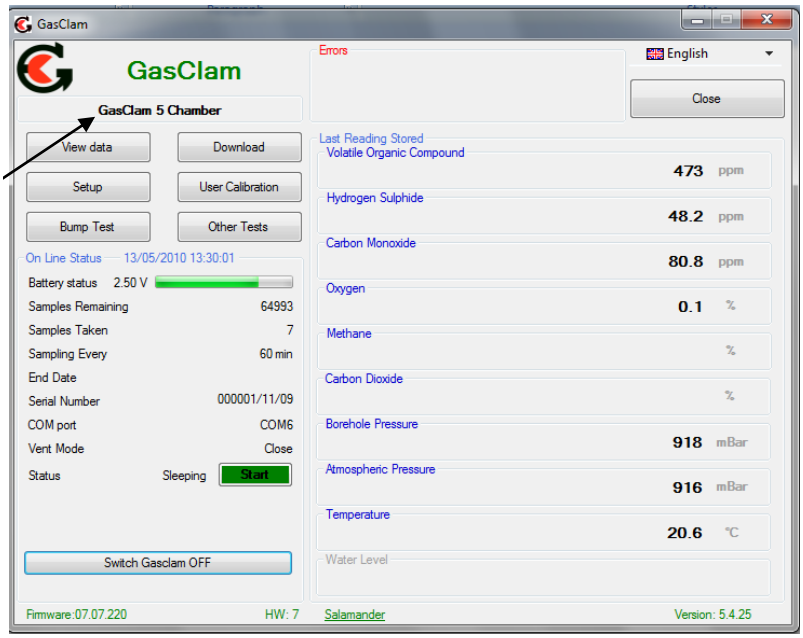
The GasClam is connected to a computer using the supplied cable via the communication port on top of the GasClam and a serial port. If the computer does not have a serial port use a standard USB/Serial converter.

You can either connect the unit before or after starting the software. If the software is opened before the GasClam is attached the screen appears as below. In this mode the options available are to view data (see later) or to close the application.



After the GasClam is connected the screen will update (similar to below) with the device ID displayed in box 1.

GasClam ID



The window is divided in to 3 sections, navigation tabs (view data, download, setup and user calibration, bump test, other tests), Online Status and Last Reading Stored.

Software

Main Screen

Battery status – displays battery voltage alongside a power bar, the bar changes colour according to capacity providing a rough guide to battery life*.

Green: capacity is fine for a long sampling period

Orange: Batteries need to be replaced very soon

Red: Replace batteries immediately.

*The voltage in the battery will decrease when the GasClam is sampling due to a load on the batteries, this is the voltage that should be used to assess battery condition (This is also the voltage that is logged).

Note. If the battery capacity is no longer sufficient for the running of the unit during a programme the unit automatically interrupts the cycle and switches to sleeping mode, this will be logged as a battery error. The data is stored in the flash memory therefore the data will remain in the GasClam even if the batteries are completely flat.

Samples left –displays the remaining number of samples that can be stored in the memory.

Samples taken/count – When the GasClam is in sleeping mode this reads 'samples taken' indicating how many sampling points are stored on the memory. When the GasClam is in sampling mode it reads 'Sample count' and displays the number of finished cycles and the total number of cycles in the programme. For example, 254/4500 means that 254 cycles from 4500 required cycles have finished.

Sampling every - shows the period between sampling. For example, value "1 hour." means that sampling frequency is 1 hour.

Finish on – displays the date and time that the sampling programme will finish.

Serial number – displays the serial number of the unit

COM port – displays which port the unit is connected to.

Status – displays the mode of the unit:

When the unit is running a programme the following modes are possible:

Sampling – the GasClam is actively making a measurement.

Measuring – the GasClam is between sampling periods.

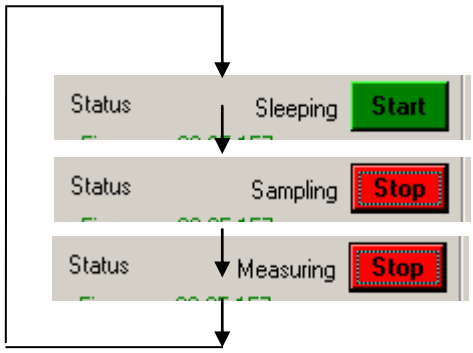
When the GasClam is not running a programme the following modes are possible:

Sleeping – the unit is not running a programme. In this mode data can be downloaded and the unit programmed.

Clear flash – the unit is erasing flash memory data

If the GasClam is not functioning correctly the status will read *'undefined status,'* if this occurs contact customer services immediately.

Software



"START/STOP" Button– this has several modes: The unit is in sleeping mode, to start the GasClam left click the button.

The unit is actively sampling (it can be stopped by left clicking the button), after this has finished the button changes to:

The unit is between samples and the programme can be stopped by left clicking the button.

After starting the GasClam through the software wait until the first cycle is complete. The last readings stored will be updated and these values can be used to check that the GasClam is functioning correctly. Also this will remind the user that the GasClam has been started before leaving it for a period of unmanned data collection.

Firmware – shows the firmware version in the unit. Always use the software designated for the given firmware version.

Last reading stored

The last recorded values are displayed in the 'Last Reading Stored' box. If the sampling cycle has started, these values will display 'measuring' and are updated throughout the sampling process.

The displayed ranges of individual sensors are as follows:

Methane – 0-100%

Carbon Dioxide – 0-100%

Oxygen – 0-25%

Borehole Pressure – 800 -1200 mBar

Barometric Pressure – 800 – 1200 mBar

Temperature - -5°C to +50°C

Optional *Water Level* – 0-25m

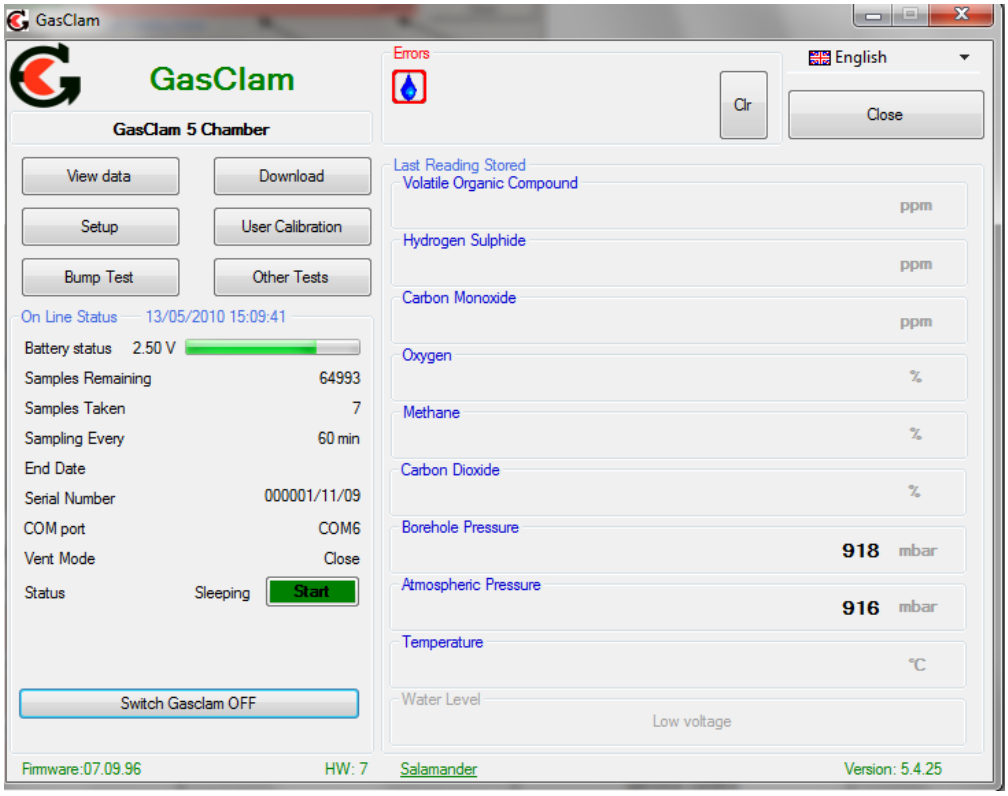
Optional *Dual CO/H2s sensor* 0-1000ppm/0-100ppm

Optional VOC 1 PPM 0-4,000PPM

Software

Errors

If the GasClam is not functioning correctly an error message will be displayed at the top of the Software home screen, see below.



Software

Different errors require different solutions, these are summarised below;

Error	Reason	Solution
Low Battery	Battery voltage is below 1.8V for 10s	GasClam will run but batteries need to be changed
Flat Battery	Battery voltage is below 1.8V for 60s	The GasClam will not sample, batteries must be changed
Filter Error	The moisture stripping filter is clogged	Change the moisture stripping filter. If this does not work then call the service centre
Immersion	Water in the borehole has risen to the base of the GasClam	When water level drops the GasClam will start sampling again
AD Overflow	The AD convertor is not working.	Check to see if it has happened only once or if it is a permanent error. If permanent reset the GasClam by removing and replacing batteries. If problem persists call the service centre.
Flash Busy	The memory has timed out	Check to see if it has happened only once or if it is a permanent error. If permanent reset the GasClam by removing and replacing batteries. If problem persists call the service centre.
Full Memory	The memory is full	Download GasClam and clear memory
Error SPI Flash	The flash memory has not worked correctly	Check to see if it has happened only once or if it is a permanent error. If permanent reset the GasClam by removing and replacing batteries. If problem persists call the service centre.
Error Write	Error writing to the flash memory	Check to see if it has happened only once or if it is a permanent error. If permanent reset the GasClam by removing and replacing batteries. If problem persists call the service centre.
Pump	Pump is not working correctly	Call service centre.

After the problem has been resolved clear the error message by clicking 'clr'.

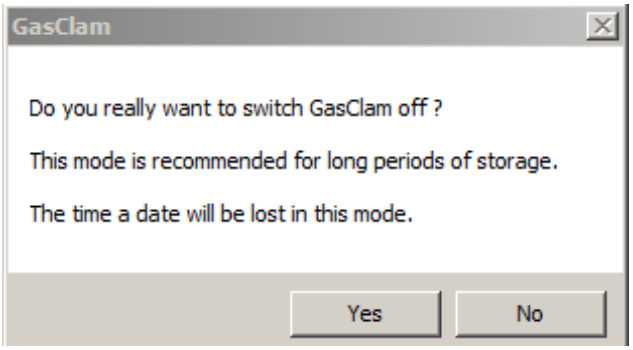
To help trouble shoot errors the service centre will need the .gcl, .gce and .csv file (see page 23)

Software

Switching off the unit

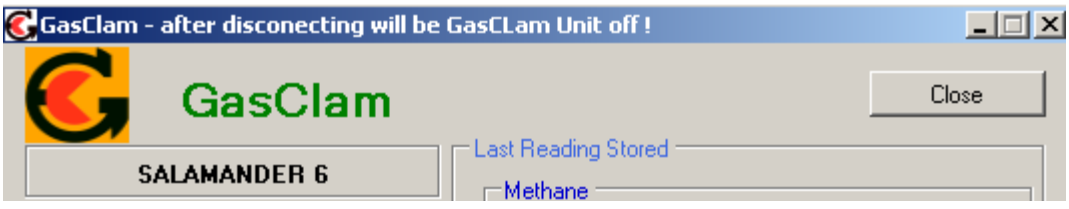
If the unit is not going to be used for a long period it is recommended that it is turned off using the 'OFF' button, this reduces the discharge from the batteries.

When the off button is clicked a message will appear to ask if you really want to switch off.


GasClam
Do you really want to switch GasClam off ?
This mode is recommended for long periods of storage.
The time a date will be lost in this mode.
Yes
No

If the Yes button is clicked the following appears:

The GasClam will turn off after the communication cable is disconnected, until then the main screen will appear as below:

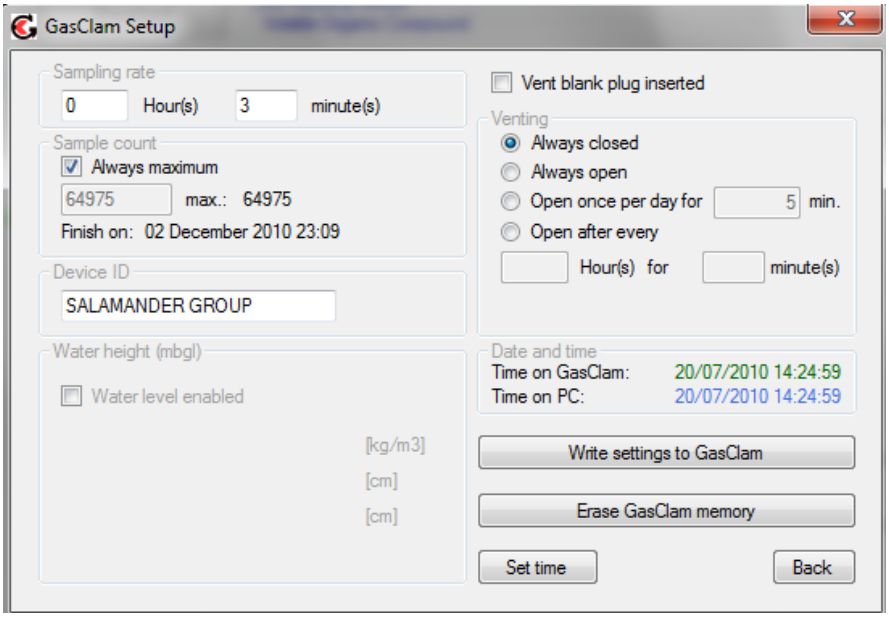


The GasClam will turn back on when the data cable is attached again.

Software

Setup

The GasClam is programmed in the setup window and is accessed by left clicking the 'set up' navigation tab, and the set up window then appears as below.



Sampling Rate

The sampling rate is defined in the Set Sample Rate box, the fastest sampling rate is 3 minutes (This is how long all the processes take), the longest 999 hours and 60 minutes..

Sample count

The number of samples to be taken can either be set to the maximum possible by clicking the 'Always Maximum' button or defined by the user in the Sample count box. The maximum figure displayed is 65000 (total memory space) minus the number of stored samples, the user defined value can be up to and including this.

The estimated date and time of the end the programme is displayed under the text button. This information is calculated as follows: (Sample count * sample rate) + actual date and time.

This is set to 800 as default to ensure the moisture stripping filter is not compromised.

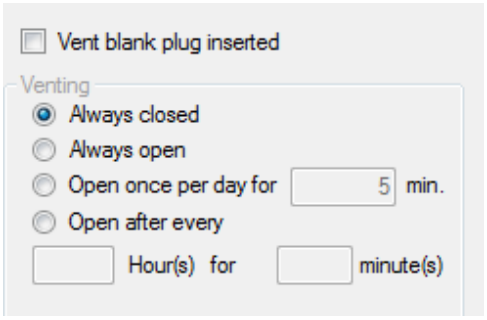
Device ID

The user can specify the name of the GasClam in the Device ID box. This is useful if there is multiple GasClam on a site as the borehole number can be allocated to the GasClam. This information is used to create a filename when the data is downloaded.

Software

Venting

The GasClam has four venting modes, which can be selected in the Venting box (see below):



Always Closed – The vent is always closed

Always Open – The vent is always open.

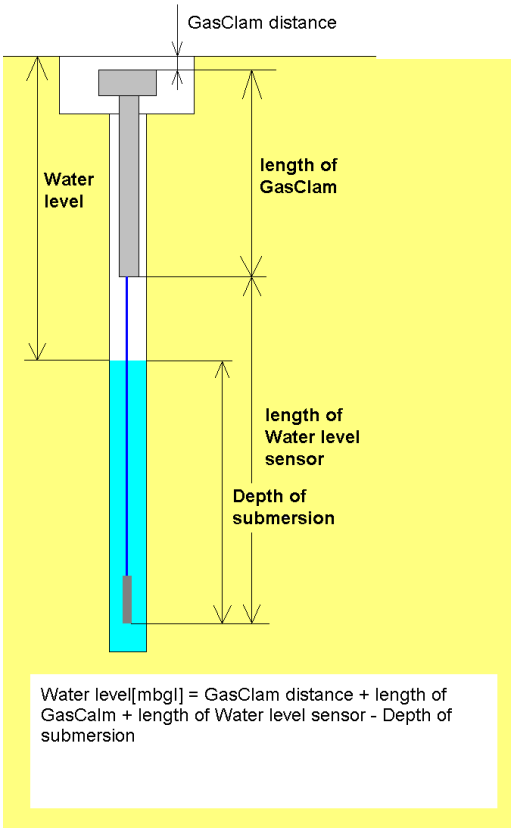
Open once per day - The vent opens once a day for a period of time defined by the user. The vent opens open immediately after the first sample and shuts after the allocated time.

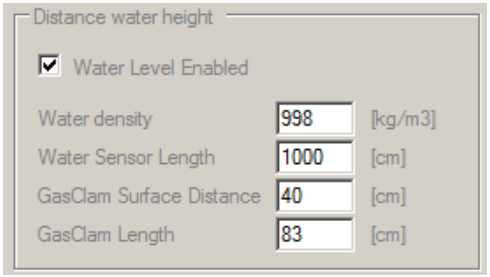
Open after every – The vent opens and stays open for user defined periods.

If the GasClam is to be located in a wet area and the vent blank is installed tick the vent plug inserted box.

Water height

The GasClam can measure the water level in the borehole using an optional pressure transducer. To enable the water level pressure transducer the 'water level enabled' box in the Distance water height area needs to be ticked. The GasClam reports the level in meters below ground level (mbgl) however, in order to calculate this distance 3 parameters need to be entered; water density, water sensor length and the distance of the GasClam to the surface, see diagram below. Pure water has a density of 1000 kg/m3 at 4°C. Borehole pressure affects the water level reading but this is automatically corrected.

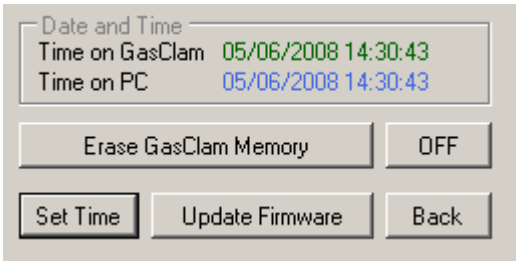

GasClam distance
Water level
length of GasClam
length of Water level sensor
Depth of submersion
Water level[mbgl] = GasClam distance + length of GasCalm + length of Water level sensor - Depth of submersion



Software

Unit date and time

The time and date of the unit and computer are displayed in the Date and Time box, and are synchronised by left clicking the Set Time tab.



The date and time is not stored when the unit is switched off or when the batteries run out or changed.

Note. The time on the unit is likely to differ from the computers if the device was programmed on a different computer to the one it now is connected to.

Write Settings to GasClam

To activate a change in the setup up menu the 'write settings to GasClam' button must be clicked. If this is successful a message saying 'Settings written successfully' appear. Click OK to continue.

Erasing Data Memory

To erase all the data from the flash memory left click the Erase memory button. The status will change to 'Clear Flash' during this process, when this is finished the status will change to 'Sleeping'

Warning – This process erases stored data permanently. Make sure you have downloaded the data from the GasClam onto your computer.

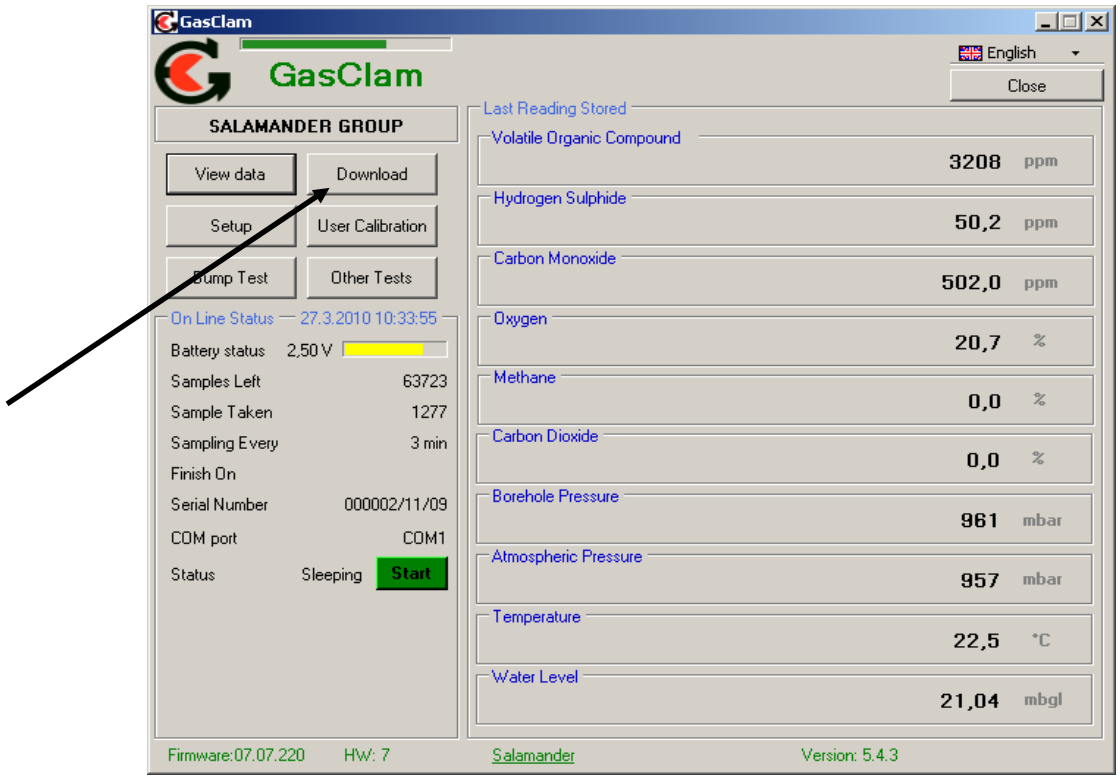
Return to main screen

To return to the GasClam software's main window use the back button.

Software

Downloading

To download the GasClam left click the 'Download' button. This opens a standard Window's 'save as' window. The default file name is the device ID followed by the time and date.



After choosing the file name and location the download begins when save is clicked, the length of the download will depend upon the amount of data.

Three files are produced

.GCL This is the file format to read within the GasClam software.
.CSV This file contains all the recorded parameters and can be used to view and plot the data in excel
.GCE This file contains information on the settings and performance of the GasClam. This is used by service centres for trouble shooting.

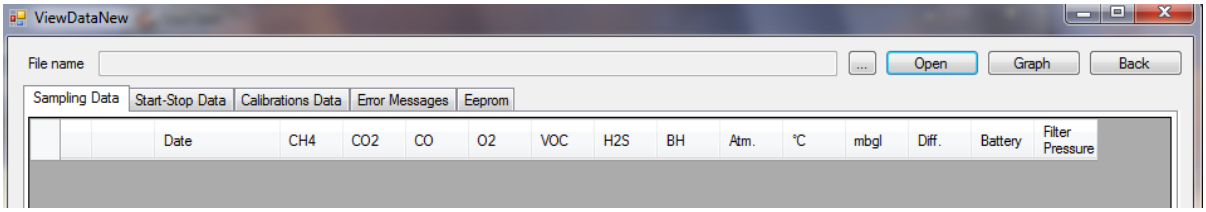
Software

Viewing Data

The data viewer is accessed via the 'View Data' navigation button on the main screen.

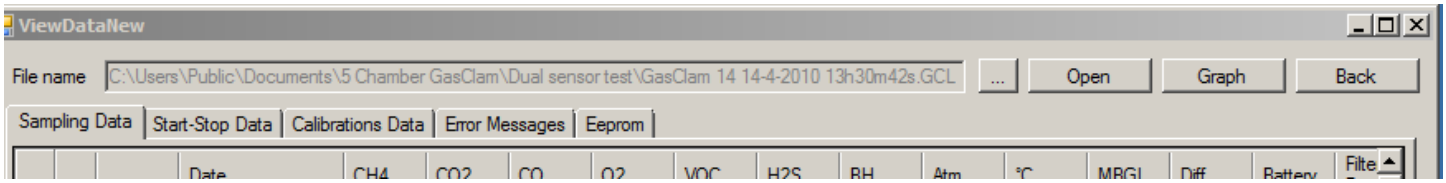
Selecting file for display

To open a file click either the '…' or the open button, this allows you to browse through your computers folders.



Data Display Options

There are 5 types of data that can be viewed, Sampling Data, Start-Stop Data, Calibration Data, Error Messages and Eeprom. These are accessed using the tabs.



Software

Sampling data

To display the sampled data click the 'Sampling-data' button. The following parameters are displayed, see example below.

Date: in the format dd/mm/yyyy hh:mm

CH_4 %: Methane, % v/v

CO_2 %: Carbon dioxide, % v/v

CO: Carbon Monoxide, ppm

O_2 %: Oxygen, % v/v

VOC: Volatile Organic Compound, ppm

H_2S: Hydrogen Sulphide, ppm

BH: Borehole pressure, mBar

Atm: Atmospheric pressure, mBar

Diff: Differential pressure between borehole and atmosphere. If the value is negative it means the pressure in the borehole is lower than atmospheric and if the pressure is positive it is higher than atmospheric.

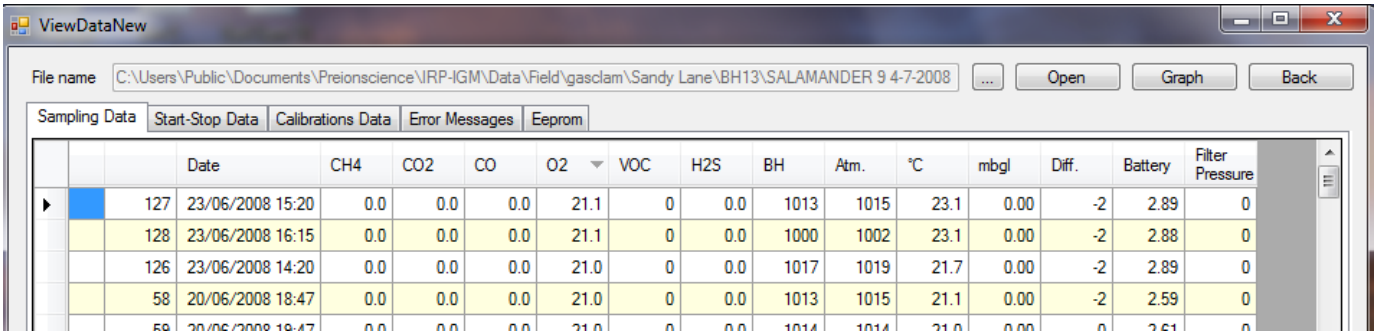
°C: Temperature in degrees Celsius

mbgl: Water level meters below ground level

Battery: Battery capacity, volts

Filter Pressure: measures pressure differential across filter, this can be used to assess the gas flow path

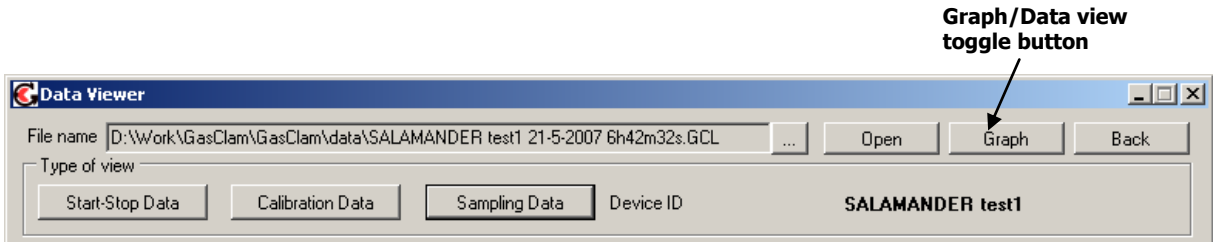
It is possible to order the displayed data according to individual parameter by clicking the column header, one click arranges them in ascending another click arranges them in descending order.



	Date	CH4	CO2	CO	O2	VOC	H2S	BH	Atm.	°C	mbgl	Diff.	Battery	Filter Pressure
127	23/06/2008 15:20	0.0	0.0	0.0	21.1	0	0.0	1013	1015	23.1	0.00	-2	2.89	0
128	23/06/2008 16:15	0.0	0.0	0.0	21.1	0	0.0	1000	1002	23.1	0.00	-2	2.88	0
126	23/06/2008 14:20	0.0	0.0	0.0	21.0	0	0.0	1017	1019	21.7	0.00	-2	2.89	0
58	20/06/2008 18:47	0.0	0.0	0.0	21.0	0	0.0	1013	1015	21.1	0.00	-2	2.59	0

Software

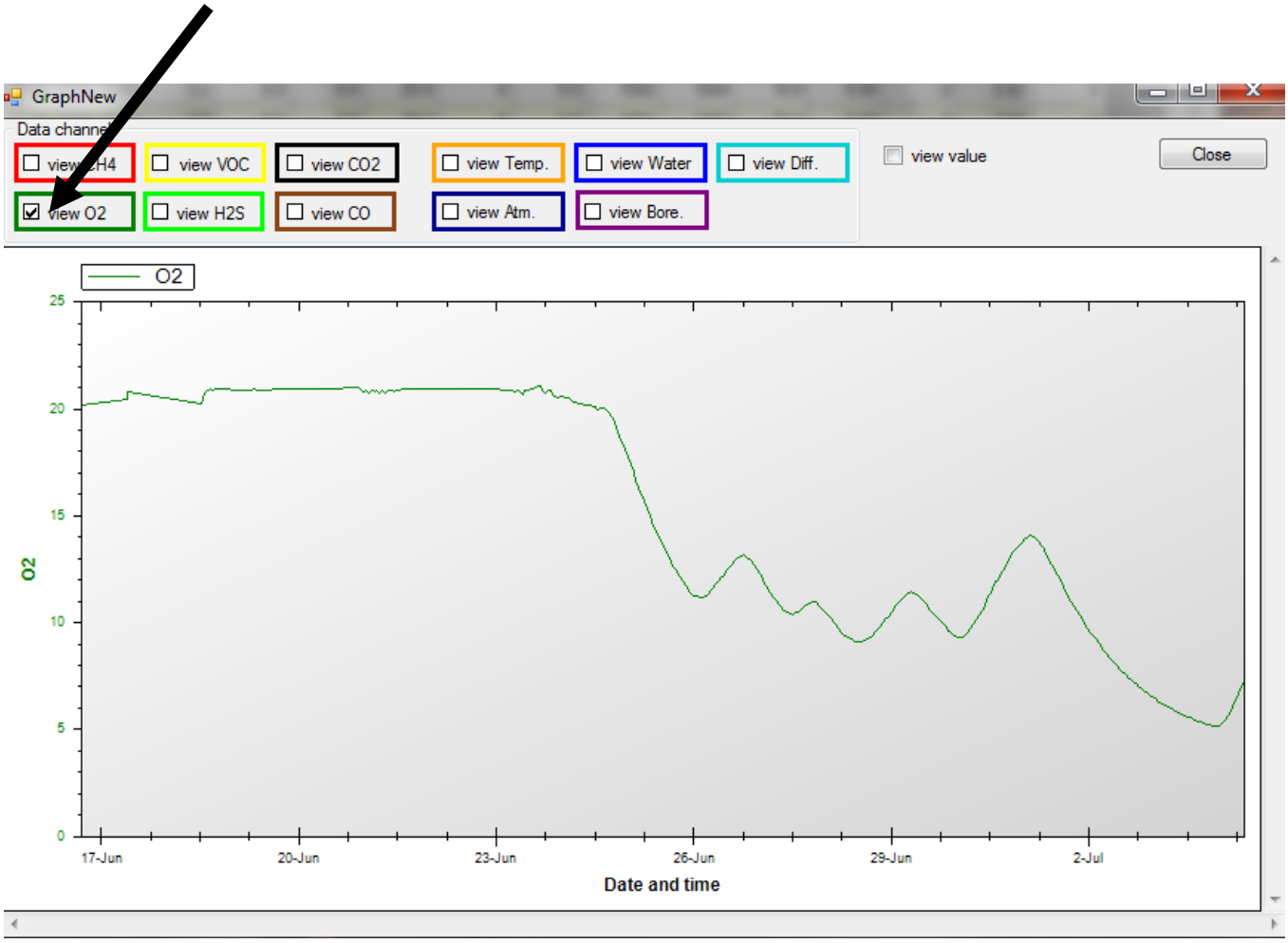
To view the data in graphical form click the Graph/Data view toggle button.



This opens the Graph view window, shown on next page.

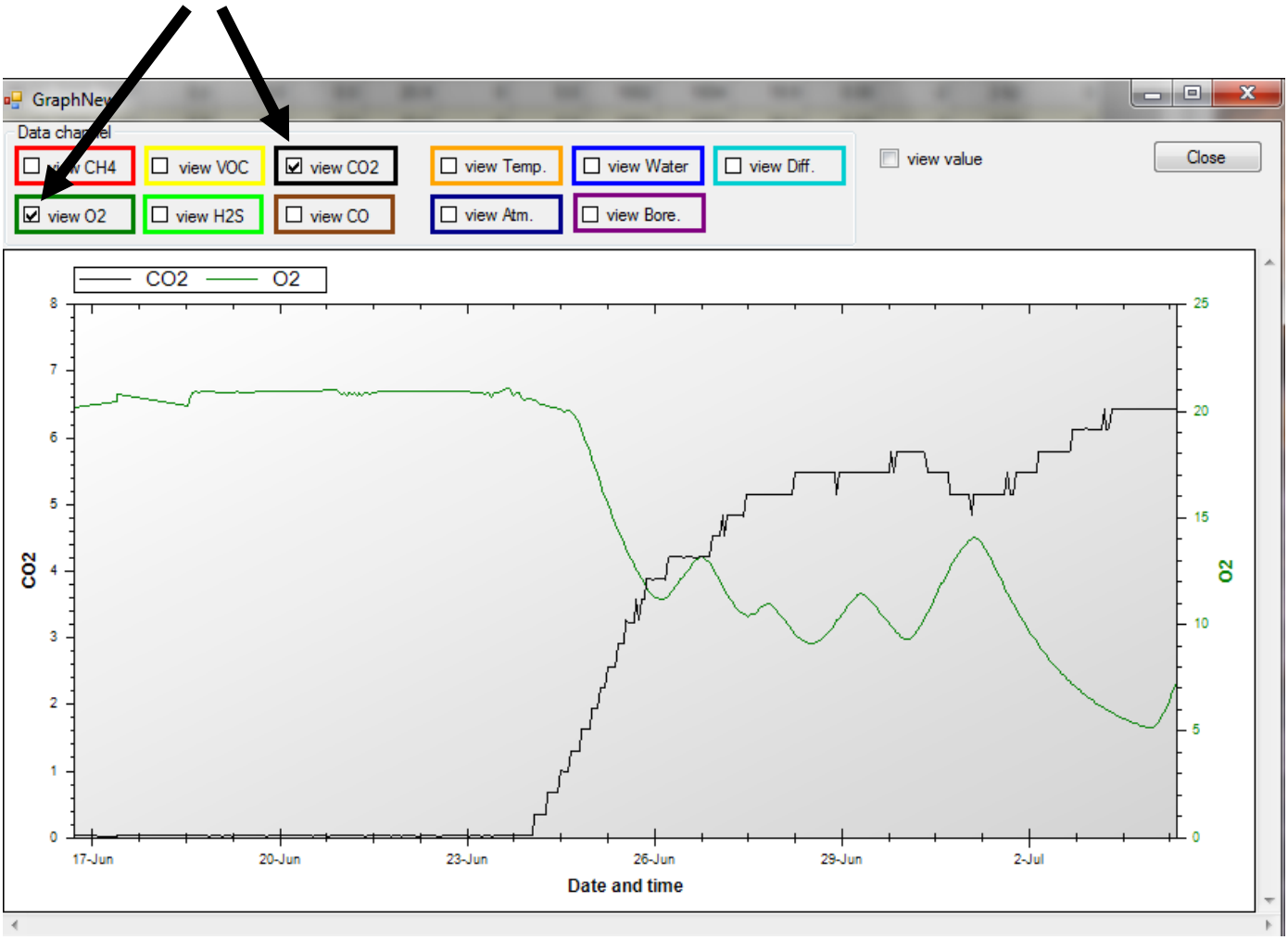
Selecting data channel

To select a data channel click the desired parameter from the 'Data Channel' box, see below. Multiple parameters can be displayed by clicking more parameters.



Software

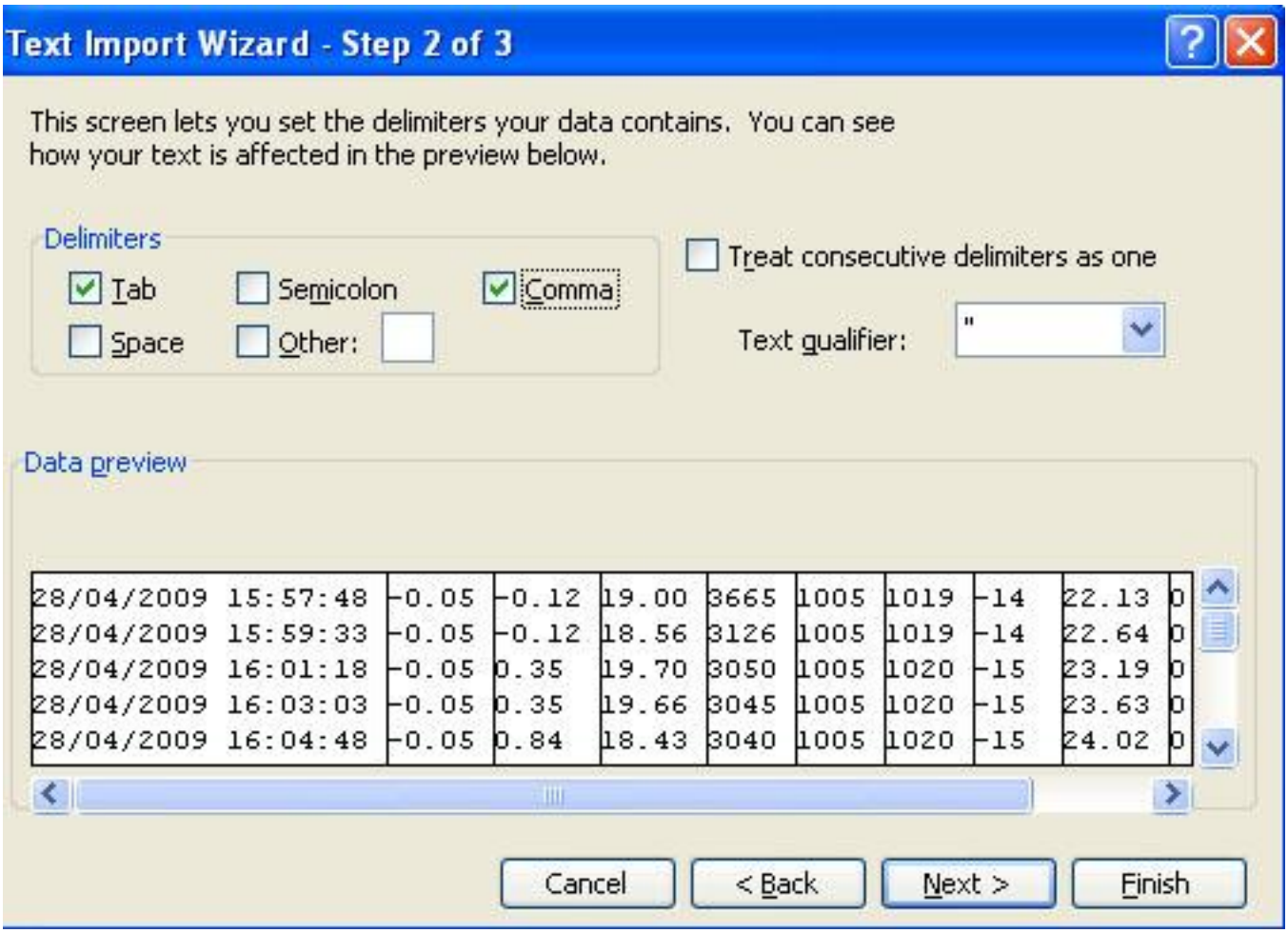
Displayed multiple parameters



Software

Import data into External Spreadsheet

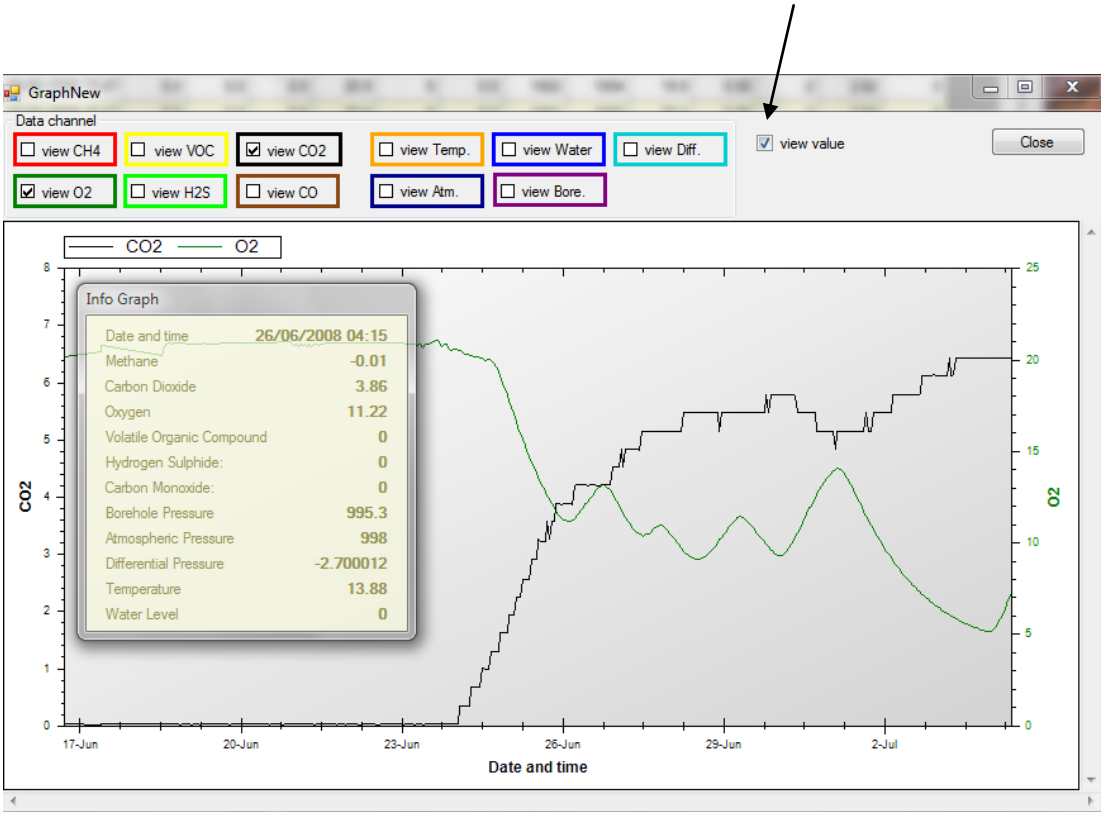
Data is provided as a **CSV** file and can be imported into various spreadsheets for manipulation. This is normally done using the import function and selecting delimited and then selecting comma as the separator.


Text Import Wizard - Step 2 of 3
This screen lets you set the delimiters your data contains. You can see how your text is affected in the preview below.
Delimiters
Tab
Semicolon
Comma
Space
Other:
Treat consecutive delimiters as one
Text qualifier:
"
Data preview
28/04/2009 15:57:48 -0.05 -0.12 19.00 3665 1005 1019 -14 22.13 0
28/04/2009 15:59:33 -0.05 -0.12 18.56 3126 1005 1019 -14 22.64 0
28/04/2009 16:01:18 -0.05 0.35 19.70 3050 1005 1020 -15 23.19 0
28/04/2009 16:03:03 -0.05 0.35 19.66 3045 1005 1020 -15 23.63 0
28/04/2009 16:04:48 -0.05 0.84 18.43 3040 1005 1020 -15 24.02 0
Cancel
< Back
Next >
Finish

Software

Infograph

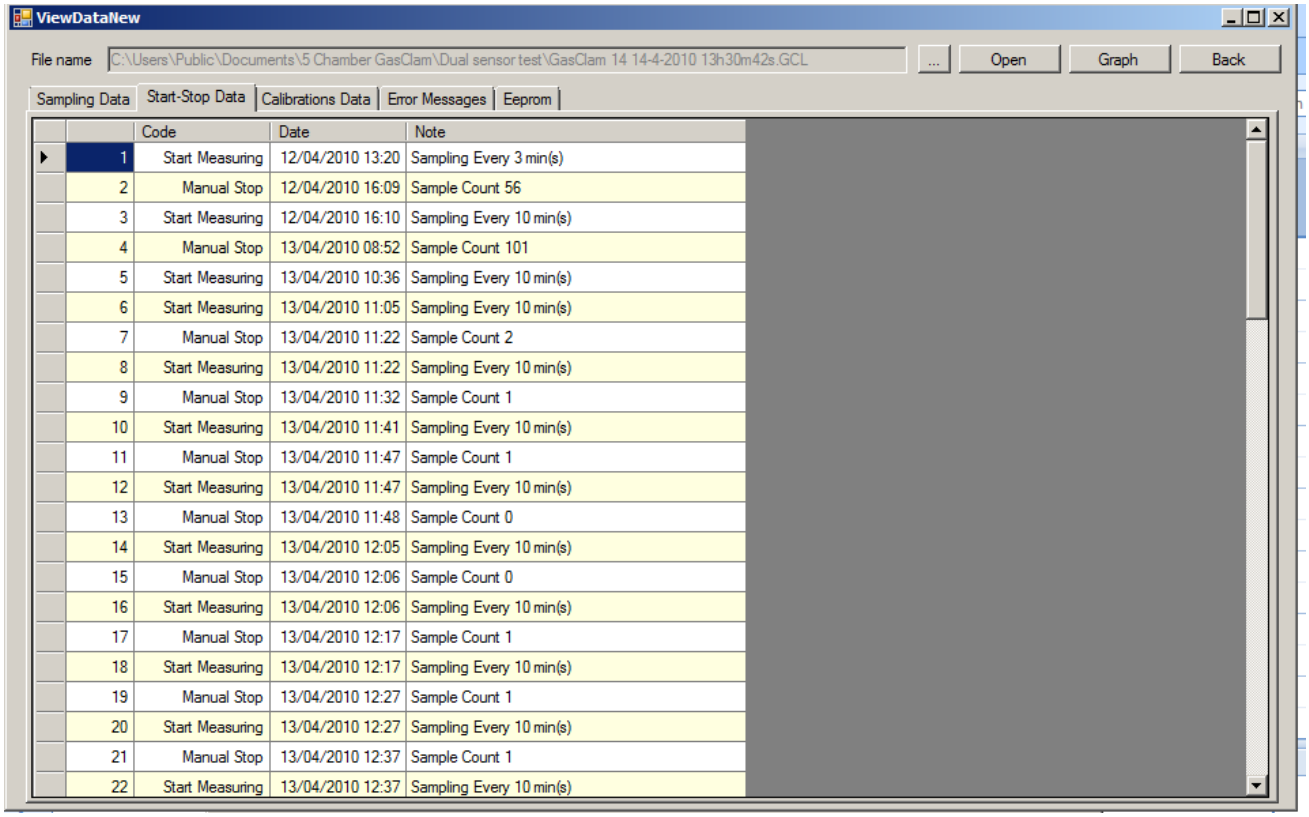
All the values of the parameters at any particular time can be displayed by using the info graph window. This is turned on by clicking the 'view value' box. These values will update as the cursor is dragged over the graph.



Start-Stop data

To display the sampling log of the unit click the 'Start-Stop' Data button. Information regarding when and how the unit was started and stopped, date the action was taken, memory space left and sampling frequency and how many samples was taken is reported, see below for an example.

Software



	Code	Date	Note
1	Start Measuring	12/04/2010 13:20	Sampling Every 3 min(s)
2	Manual Stop	12/04/2010 16:09	Sample Count 56
3	Start Measuring	12/04/2010 16:10	Sampling Every 10 min(s)
4	Manual Stop	13/04/2010 08:52	Sample Count 101
5	Start Measuring	13/04/2010 10:36	Sampling Every 10 min(s)
6	Start Measuring	13/04/2010 11:05	Sampling Every 10 min(s)
7	Manual Stop	13/04/2010 11:22	Sample Count 2
8	Start Measuring	13/04/2010 11:22	Sampling Every 10 min(s)
9	Manual Stop	13/04/2010 11:32	Sample Count 1
10	Start Measuring	13/04/2010 11:41	Sampling Every 10 min(s)
11	Manual Stop	13/04/2010 11:47	Sample Count 1
12	Start Measuring	13/04/2010 11:47	Sampling Every 10 min(s)
13	Manual Stop	13/04/2010 11:48	Sample Count 0
14	Start Measuring	13/04/2010 12:05	Sampling Every 10 min(s)
15	Manual Stop	13/04/2010 12:06	Sample Count 0
16	Start Measuring	13/04/2010 12:06	Sampling Every 10 min(s)
17	Manual Stop	13/04/2010 12:17	Sample Count 1
18	Start Measuring	13/04/2010 12:17	Sampling Every 10 min(s)
19	Manual Stop	13/04/2010 12:27	Sample Count 1
20	Start Measuring	13/04/2010 12:27	Sampling Every 10 min(s)
21	Manual Stop	13/04/2010 12:37	Sample Count 1
22	Start Measuring	13/04/2010 12:37	Sampling Every 10 min(s)

Note. If the GasClam has stopped due to low battery a note indicating this will be left in the code column.

Calibration Data

In this section the calibration date and constants are displayed.

Error Messages

All errors are logged and can be viewed here (see pg 16 for details)

Eeprom

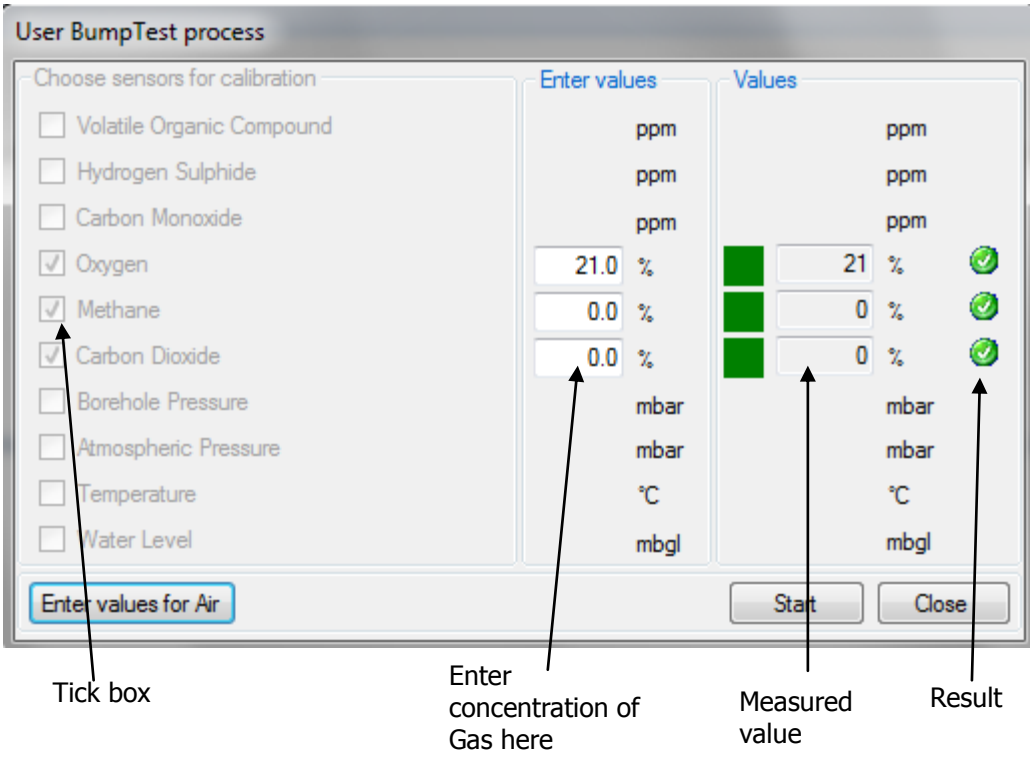
Firmware constants are displayed in this tab. These are useful for the service centre when trouble shooting.

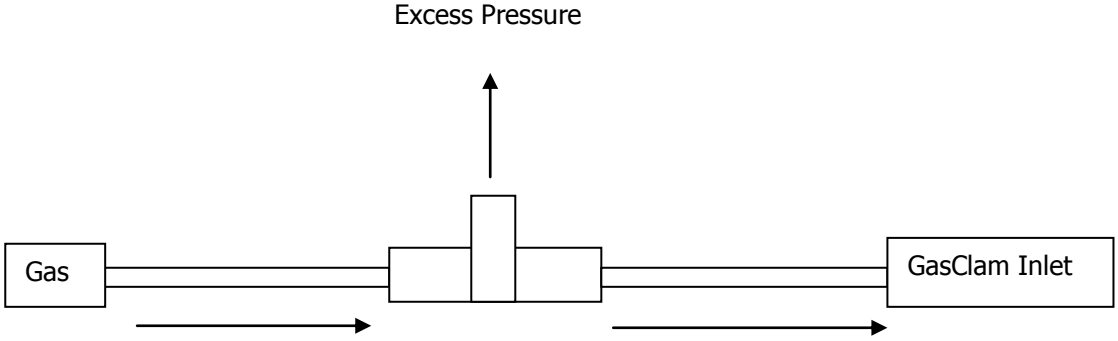
Software

Bump Test

You can check the performance of the sensors by running a bump test on your GasClam. During a bump test a known concentration of gas is pumped through the GasClam and the value measured is displayed. If the measured concentration is within the tolerance of the sensor the bump test is passed and indicated by a tick, if it is outside this range the bump test is failed and indicated by a cross. The values are informative only (i.e., nothing is saved on the GasClam settings) and used to decide if a calibration is required.

The bump test menu is entered by clicking the 'Bump Test' button on the main screen. To check the performance of the relevant sensor(s) tick the box next to the sensor name, then enter the concentration of the test gas in the 'Enter Values' column . If you want to test atmospheric gas the 'Enter values for Air' button can be used to set the concentrations. Before starting the test connect the gas line to the inlet barb. The test is then started by clicking the 'Start' button. The whole bump test cycle will take approximately two minutes after which the measured concentration is displayed in the 'Values' column and the result of the test is indicated by a cross or tick. If a cross occurs call your service centre and they will advise on action. The sensors must be checked at atmospheric pressure, as the calibration gas bottle will be pressurised it is important that the excess pressure is vented. This is achieved by attaching a T-piece between the gas bottle and inlet, see diagram below.



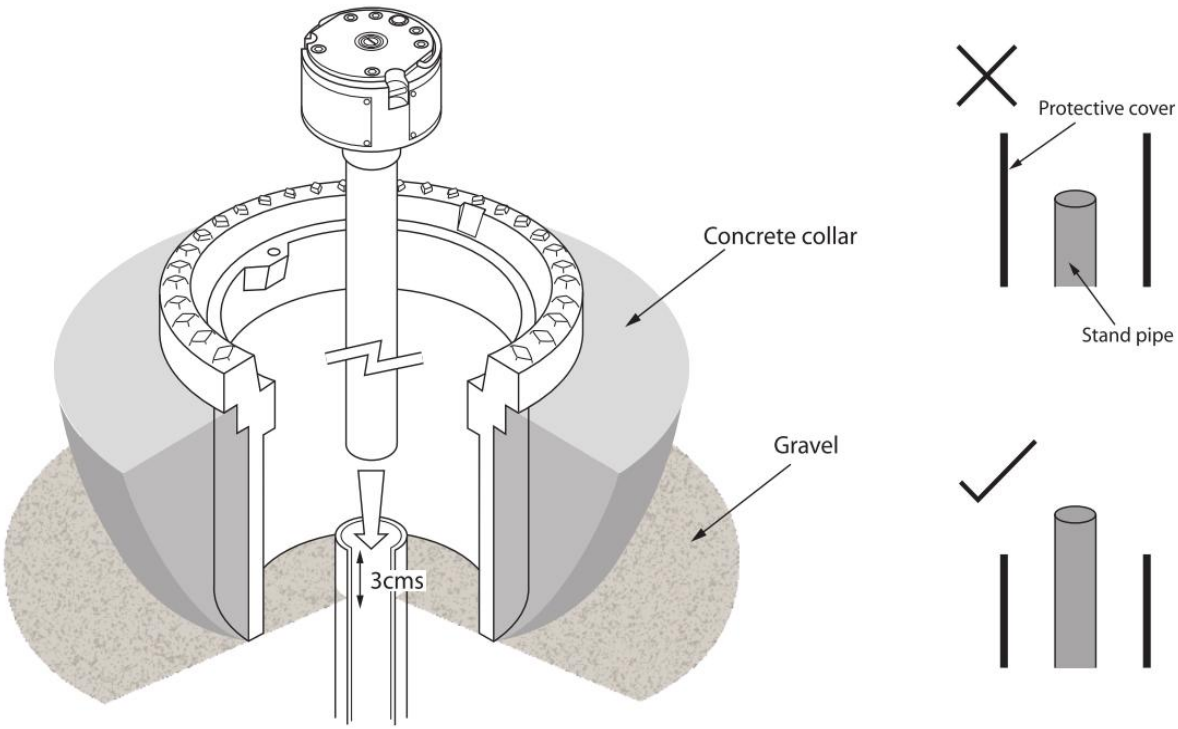


Other tests

This section is for service centres.

Installing GasClam in a Borehole

The GasClam is designed to fit in to a 50 mm borehole. The recommended headworks are 8" Monitoring wells from Stuart Wells (http://wellservices.stuartgroup.ltd.uk/) and should be installed following the diagram below:



It is important to have the stand pipe a maximum of 3 cm above the base of the headworks, this will ensure the GasClam will fit under the lid of the cover. The headworks must be concentric to the standpipe for the GasClam to be housed correctly. The standpipe must also be cut square to allow a good seal.

If a protective cover is to be used make sure this ends below the top of the standpipe otherwise the GasClam will not fit correctly.

Service and Calibration

Unit calibration

Calibration should only be carried out by an authorised GasClam distributor.

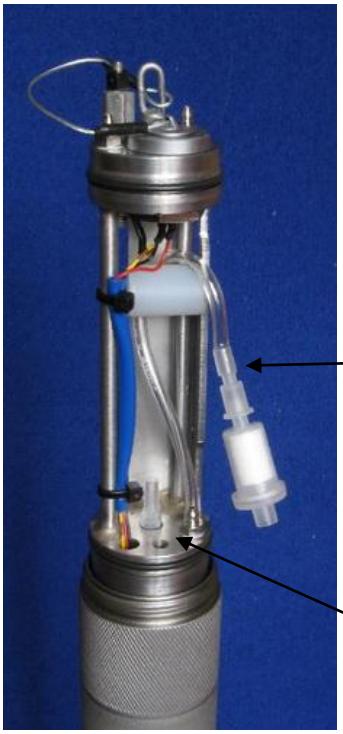
Service

The GasClam should be regularly serviced to ensure correct and accurate operation. It is recommended that it should be serviced and recalibrated every 12 months.

The GasClam is ATEX certified for use in potentially explosive areas therefore it should only be serviced by qualified engineers. Failure to do so will invalidate the warranty.

User serviceable parts

Moisture stripping filter: It is recommended that the moisture filter is replaced every time the GasClam is visited. It is accessed by unscrewing the bottom section of the GasClam. This is done by holding the knurl on the middle section and gripping the knurls on the top section and turning, see below. The instrument should never be operated without the filter.



To remove filter;

1) Pull of lower section
2) Pull of upper section

Service and Calibration

Snorkel: The snorkel should be checked regularly, if there is any damage replace immediately

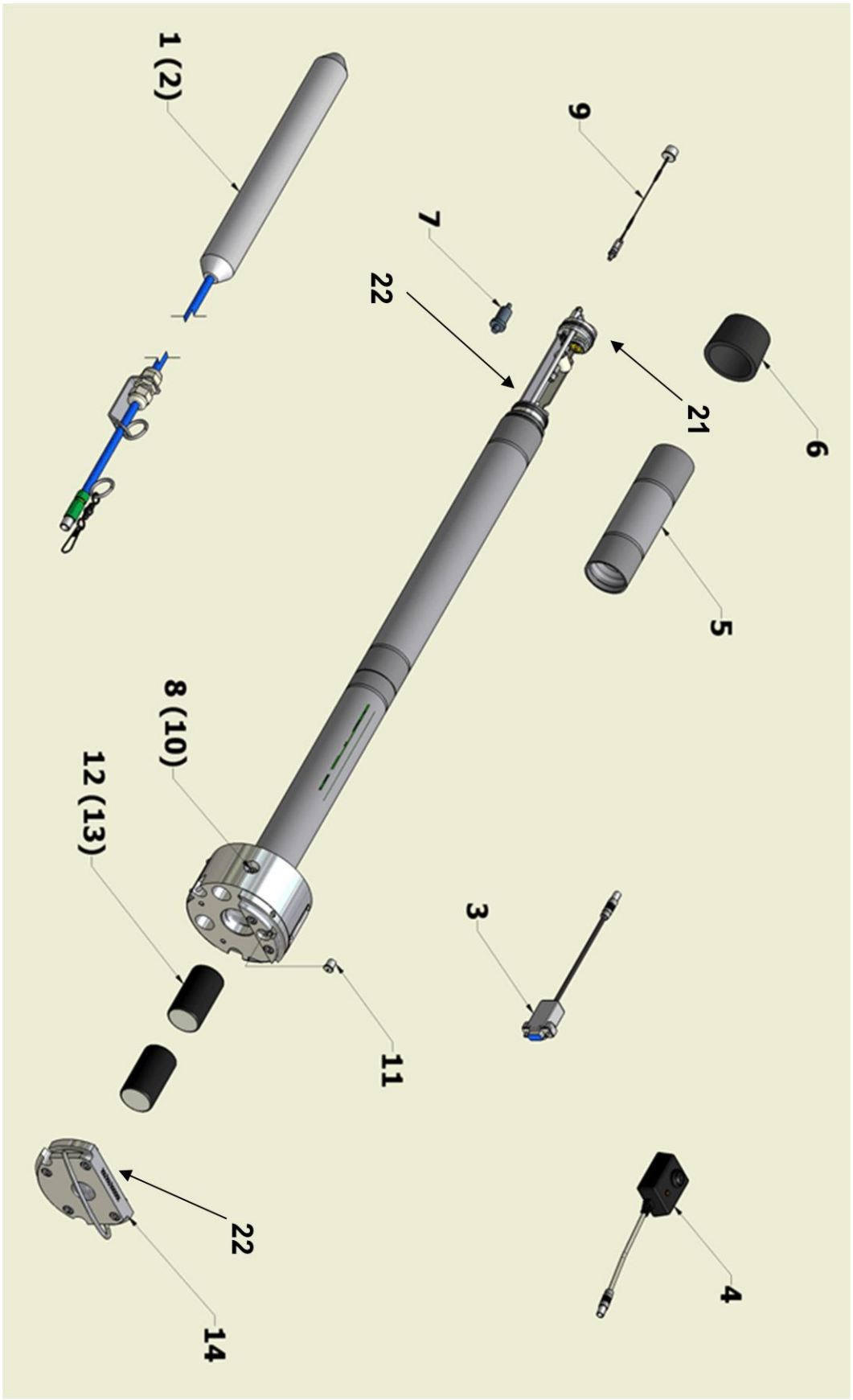
Collar: Inspect the collar regularly, if there is any signs of damage replace immediately.

Battery compartment O – ring: Inspect regularly and if there is any sign of damage replace immediately

Item Ref.	Part Number	Description
1	25039	Water Level Sensor
2	TBC	TBC
3	25030	RS 232 Communication Cable
4	25031	Push Button Control
5	25032	Moisture stripping filter tube
6	25033	Rubber Collar
8(10)	25035 (2/SA5-8)	Vent hose barb (vent blank)
7	25034	Moisture Stripping Filter (pack of 10)
9	25036	Water level comms port cover and cable
11	25037	Communication Cover and Cable
12	1/BA-03	Battery Alkaline MN 1300 D (2 required)
13	25065	Rechargeable Battery Pack
TBC	TBC	Battery Cover Bolt
TBC	25062	Charger NiMH ECH 1.1
14	25038	Battery Cover (complete)
21	A-25066	O-Ring for filter section (near base of GasClam) Pack of 5
22	A -25067	O-Ring for filter section (upper O-ring) and battery compartment, pack of 5
TBC	A-25064	Snorkel
	A - 25083	Accessory Kit

Service and Calibration

Spare parts for users



Technical Specification

Sensor	Method/type	Range	Resolution	Accuracy	Linearity
CH_4	Infrared	0-100 %	1% of measuring range above 50%, 0.5% below 50%.	± 2% FSD	+/- 2% FSD or 10% reading
CO_2	Infrared	0-100 %	1% of measuring range above 50%, 0.5% below 50%.	± 2% FSD	+/- 2% FSD or 10% reading
Oxygen	Electrochemical	0-25 %	0.1 %	± 5% of reading ± 1 digit	>1 % O_2 deviations @ 10% O_2
CO*	Electrochemical	0-1000 PPM	1 PPM	<± 6ppm at 0, ± 5% at 250 ppm	Linear at 0 and 400ppm, error at full scale <40ppm
H_2S*	Electrochemical	0 - 100	1 PPM	<± 1 ppm at 0, ± 5% at 50 ppm	Linear at 0 and 20ppm, error at full scale 0 to -9ppm
VOC*	PID	0-4,000 PPM	1 PPM	± 5% of reading ± 1 digit	+/- 5% to 100 ppm

Other range and resolution CH_4 and CO_2 sensors are available on request.

Environmental	Method / Type	Range	Resolution
Barometric Pressure	Piezoelectric	800-1200 mBar	1 mBar
Borehole Pressure	Piezoelectric	800-1200 mBar	1 mBar
Temperature	Internal Chip	-5°C to +50°C or 41°F to 122°F	1°C or 1°F
Water depth*	Piezoelectric	0 – 25 m	0.01m

* Optional

Memory	65000 time / date stamped readings
Power	Internal x 2 Alkaline D-cells or rechargeable battery pack
Battery Life	Approximately 1 month (Based on hourly sampling with rechargeable battery pack)
Case	High Quality Stainless Steel
Weight	6 kg or 13.2 lb
Protection	IP – 68 (continuous submersion)
Operation	–5 - +50 °C or 41°F to 122°F
Approvals	CE, EMC, ATEX, 0105 X, Ex II 2G, Ex d ib [ib] IIB T4
Certification rating	Ex 2G Ex d ib [ib] IIb T4
Certificate number	FTZU 07 ATEX 0105 X

Specifications obtained under laboratory conditions of gas flow, temperature and humidity. Field performance is dependent on the correct installation procedures been followed, environmental conditions, frequent sensor cleaning and regular calibration. Some of the sensors have cross sensitivity, for more information contact Ionscience.

Update Log

Manual Version	Amendment	Date Updated	Instrument Firmware	Instrument Software
GasClam V1.0	Layout and Content Updated. Updated to version 1.1	09/04/09	06.04.75	3.7.8
GasClam V1.1	Spare parts list and diagrams for users added. Updated to version 1.2	27/04/09	06.04.75	3.7.8
GasClam V1.2	InfoGraph image updated and general Layout of Manual updated. Updated to version 1.3	06/06/09	06.04.75	3.7.8
GasClam v1.3	Extra sections added for 5 chamber GasClam. Section how to protect the GasClam from water. Moisture stripping filter instructions updated. Intallation section added Updated to version 1.4	15/06/09	07.09.96	5.4.25
GasClam v1.4	Manual has been completely updated for new version of GasClam. Accessory pack added. Communication to be sent out to all distributors and customers to notify them. Updated to V1.5	27/07/09	07.09.96	5.4.30

Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.

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Fax: +44 (0)1245 808399
Email: sales@keison.co.uk

Please note - Product designs and specifications are subject to change without notice. The user is responsible for determining the suitability of this product.